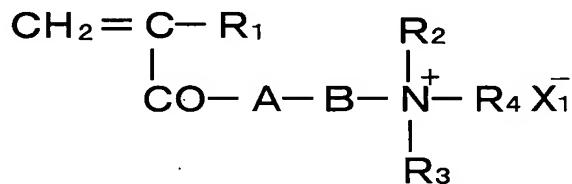


CLAIMS

1. A water-soluble polymer dispersion in which a water-soluble polymer having at least one type of ionicity selected from among cationicity, an amphotericity, a 5 nonionicity and an anionicity and occurring as fine particles with a particle size of not greater than 100 μm and a polyalkylenimine and/or a modified polyalkylenimine coexist, if necessary together with a necessary amount of a water-soluble inorganic salt.
- 10 2. A water-soluble polymer dispersion according to Claim 1, wherein the water-soluble polymer having at least one type of ionicity selected from among said cationicity and said amphotericity and occurring in the form of fine particles is produced by dispersion polymerization of a monomer (or monomer mixture) comprising 5 to 100 mole percent of a monomer represented by the general formula (1) and/or (2) given below, 0 to 50 mole percent of a monomer represented by the general formula (3) given below and 0 to 95 mole percent of a water-soluble nonionic monomer with stirring in the presence of said polyalkylenimine and/or modified polyalkylenimine, if necessary further in the presence of a necessary amount of a water-soluble inorganic salt.

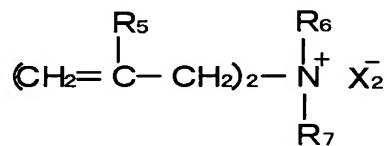


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General formula (1)

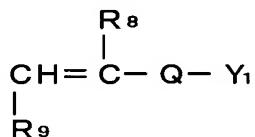
(In the general formula (1), R_1 is a hydrogen atom or a methyl group, R_2 and R_3 may

be the same or different and each is an alkyl or an alkoxy group containing 1 to 3 carbon atoms or a benzyl group, R₄ is a hydrogen atom, an alkyl or alkoxy group containing 1 to 3 carbon atoms or a benzyl group. A represents an oxygen atom or NH, B represents an alkylene or an alkoxylen group containing 2 to 4 carbon atoms, 5 and X₁ represents an anion.)



General formula (2)

(In the general formula (2), R₅ represents a hydrogen atom or a methyl group, R₆ and R₇ each represents an alkyl or an alkoxy group containing 1 to 3 carbon atoms or a 10 benzyl group, and X₂ represents an anion.)

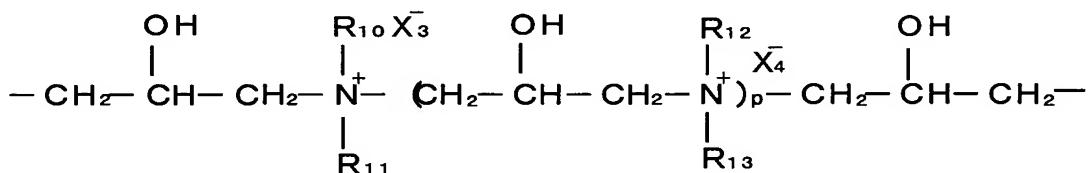


General formula (3)

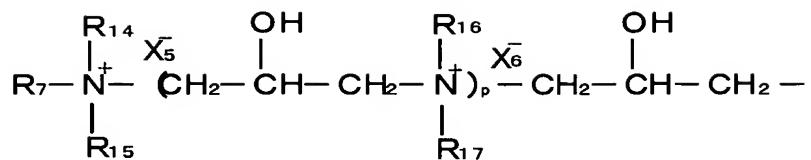
(In the general formula (3), R₈ represents a hydrogen atom, a methyl group or a carboxymethyl group, Q represents SO₃, C₆H₄SO₃, CONHC(CH₃)₂CH₂SO₃, 15 C₆H₄COO or COO, R₉ represents a hydrogen atom or COOY₂, and Y₁ or Y₂ represents a hydrogen atom or a cation.)

3. A water-soluble polymer dispersion according to Claim 1, wherein the water-soluble polymer having at least one type of ionicity selected from among said anionicity and said nonionicity and occurring in the form of fine particles is produced by dispersion polymerization of a monomer composition (mixture) comprising at least 5 one monomer selected from among monomers represented by said general formula (3) given above and water-soluble nonionic monomers in the presence of said polyalkylenimine and/or modified polyalkylenimine, if necessary further in the presence of a necessary amount of a water-soluble inorganic salt.

10 4. A water-soluble polymer dispersion according to any of Claims 1 to 3, wherein said modified polyalkylenimine has a structural unit represented by the general formula (4) and/or (5) given below.



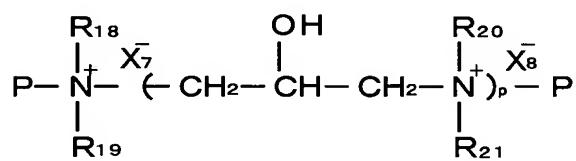
General formula (4)



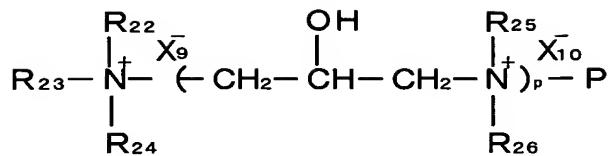
General formula (5)

(In the general formulas (4) and (5), p is an integer of 0 to 20, R₁₀ to R₁₇ each represents a hydrogen atom or an alkyl or hydroxyalkyl group containing 1 to 3 carbon atoms or a benzyl group, and X₃ to X₆ each is an anion.)

5. A water-soluble polymer dispersion according to any of Claims 1 to 4, wherein said modified polyalkylenimine comprises the reaction product from a polyalkylenimine or a mixture of a polyalkylenimine and a polyamine and a 10 polycationic substance represented by the general formula (6) and/or (7) given below.



General formula (6)



General formula (7)

(In the general formulas (6) and (7), P is an epoxy group or a halohydrin group, p is an integer of 0 to 20, R₁₈ to R₂₆ each is a hydrogen atom, an alkyl or hydroxyalkyl

5 group containing 1 to 3 carbon atoms or a benzyl group, and X₇ to X₁₀ each is an anion.)

6. A water-soluble polymer dispersion according to any of Claims 1 to 4, wherein said modified polyalkylenimine is crosslinked by means of a polycationic 10 substance represented by the general formula (6) given above.

7. A water-soluble polymer dispersion according to any of Claims 1 to 6, wherein the polyalkylenimine is polyethylenimine.

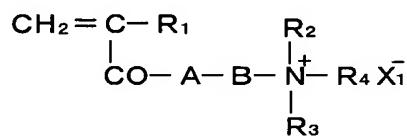
15 8. A water-soluble polymer dispersion according to any of Claims 1 to 7, wherein the polyalkylenimine and/or modified polyalkylenimine amounts to 20 to 200% by mass relative to the water-soluble polymer having at least one type of ionicity selected from among said cationicity, said amphotericity, said nonionicity and said anionicity.

20

9. A method of producing water-soluble polymer dispersions, wherein a dispersion of fine particles of a polymer having at least one type of ionicity selected

from among cationicity and amphotericity is produced by subjecting a monomer (or monomer mixture) comprising 5 to 100 mole percent of a monomer represented by the general formula (1) and/or (2) given below, 0 to 50 mole percent of a monomer represented by the general formula (3) given below and 0 to 95 mole percent of a

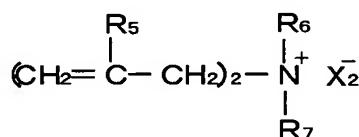
5 water-soluble nonionic monomer to dispersion polymerization with stirring in the presence of a polyalkylenimine and/or a modified polyalkylenimine, if necessary further in the presence of a necessary amount of a water-soluble inorganic salt.



General formula (1)

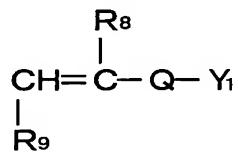
10 (In the general formula (1), R_1 is a hydrogen atom or a methyl group, R_2 and R_3 may be the same or different and each is an alkyl or alkoxy group containing 1 to 3 carbon atoms or a benzyl group, R_4 is a hydrogen atom, an alkyl or alkoxy group containing 1 to 3 carbon atoms or a benzyl group. A represents an oxygen atom or NH , B represents an alkylene or alkoxylenes group containing 2 to 4 carbon atoms, and X_1^-

15 represents an anion.)



General formula (2)

(In the general formula (2), R_5 represents a hydrogen atom or a methyl group, R_6 and R_7 each represents an alkyl or alkoxy group containing 1 to 3 carbon atoms or a benzyl group, and X_2 represents an anion.)



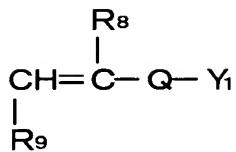
General formula (3)

5

(In the general formula (3), R_8 represents a hydrogen atom, a methyl group or a carboxymethyl group, Q represents SO_3 , $C_6H_4SO_3$, $CONHC(CH_3)_2CH_2SO_3$, C_6H_4COO or COO , R_9 represents a hydrogen atom or $COOY_2$, and Y_1 or Y_2 represents a hydrogen atom or a cation.)

10

10. A method of producing water-soluble polymer dispersions, wherein a dispersion of fine particles of a polymer having at least one type of ionicity selected from among anionicity and nonionicity is produced by subjecting a monomer composition (mixture) comprising at least one monomer selected from among 15 monomers represented by the general formula (3) given below and water-soluble nonionic monomers to dispersion polymerization with stirring in the presence of a polyalkylenimine and/or a modified polyalkylenimine, if necessary further in the presence of a necessary amount of a water-soluble inorganic salt.



General formula (3)

(In the general formula (3), R_8 represents a hydrogen atom, a methyl group or a carboxymethyl group, Q represents SO_3 , $\text{C}_6\text{H}_4\text{SO}_3$, $\text{CONHC(CH}_3)_2\text{CH}_2\text{SO}_3$, $\text{C}_6\text{H}_4\text{COO}$ or COO , R_9 represents a hydrogen atom or COOY_2 , and Y_1 or Y_2

5 represents a hydrogen atom or a cation.)

11. A method of using the water-soluble polymer dispersion according to any of Claims 1 to 8, wherein the water-soluble polymer dispersion is added to paper stuff before papermaking for pretreatment thereof.

10

12. A method of using the water-soluble polymer dispersion according to any of Claims 1 to 8, wherein the water-soluble polymer dispersion is added to paper stuff before papermaking to thereby improve the freeness thereof.

15

13. A method of using the water-soluble polymer dispersion according to any of Claims 1 to 8, wherein the water-soluble polymer dispersion is added to paper stuff before papermaking, in which a sizing agent coexists, to thereby improve the degree of sizing.

20

14. A method of using the water-soluble polymer dispersion according to any of Claims 1 to 8, wherein the water-soluble polymer dispersion is added to paper stuff before papermaking to thereby improve the yield, followed by papermaking.

25

15. A method of using the water-soluble polymer dispersion according to any of Claims 1 to 8, wherein the water-soluble polymer dispersion is added to paper stuff

before papermaking in combination with an inorganic and/or organic anionic substance to thereby improve the yield, followed by papermaking.

16. A method of using the water-soluble polymer dispersion according to any of

5 Claims 1 to 8, wherein the water-soluble polymer dispersion is added to organic sludge or paper mill-derived sludge to cause flocculation, followed by dewatering by means of dewatering equipment.

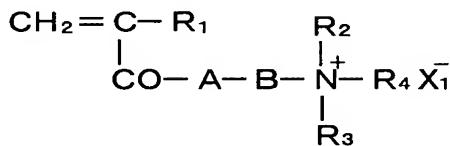
17. A method of using the water-soluble polymer dispersion according to any of

10 Claims 1 to 8, wherein the water-soluble polymer dispersion is added to organic sludge or paper mill-derived sludge in combination with an amphoteric or anionic water-soluble polymer to cause flocculation, followed by dewatering by means of dewatering equipment.

CLAIMS

1. (Amended) A water-soluble polymer dispersion in which a water-soluble polymer having at least one type of ionicity selected from among cationicity, amphotericity, 5 nonionicity and anionicity and occurring as fine particles with a particle size of not greater than 100 μm and a polyalkylenimine and/or a modified polyalkylenimine in the sulfate salt form coexist, if necessary together with a necessary amount of a water-soluble inorganic salt.

2. (Amended) A water-soluble polymer dispersion according to Claim 1, wherein the 10 water-soluble polymer having at least one type of ionicity selected from among said cationicity and said amphotericity and occurring in the form of fine particles is produced by dispersion polymerization of a monomer (or monomer mixture) comprising 5 to 100 mole percent of a monomer represented by the general formula (1) and/or (2) given below, 0 to 50 mole percent of a monomer represented by the 15 general formula (3) given below and 0 to 95 mole percent of a water-soluble nonionic monomer with stirring in the presence of said polyalkylenimine and/or modified polyalkylenimine in the sulfate salt form, if necessary further in the presence of a necessary amount of a water-soluble inorganic salt.

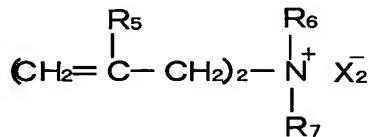


General formula (1)

20

(In the general formula (1), R_1 is a hydrogen atom or a methyl group, R_2 and R_3 may be the same or different and each is an alkyl or alkoxy group containing 1 to 3 carbon atoms or a benzyl group, R_4 is a hydrogen atom, an alkyl or alkoxy group containing 1 to 3 carbon atoms or a benzyl group. A represents an oxygen atom or NH, B

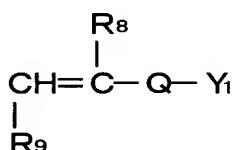
represents an alkylene or alkoxylen group containing 2 to 4 carbon atoms, and X₁ represents an anion.)



General formula (2)

5

(In the general formula (2), R₅ represents a hydrogen atom or a methyl group, R₆ and R₇ each represents an alkyl or alkoxy group containing 1 to 3 carbon atoms or a benzyl group, and X₂ represents an anion.)



General formula (3)

10

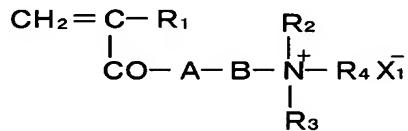
(In the general formula (3), R₈ represents a hydrogen atom, a methyl group or a carboxymethyl group, Q represents SO₃, C₆H₄SO₃, CONHC(CH₃)₂CH₂SO₃, C₆H₄COO or COO, R₉ represents a hydrogen atom or COOY₂, and Y₁ or Y₂ represents a hydrogen atom or a cation.)

15 3. (Amended) A water-soluble polymer dispersion according to Claim 1, wherein the water-soluble polymer having at least one type of ionicity selected from among said anionicity and said nonionicity and occurring in the form of fine particles is produced

by dispersion polymerization of a monomer composition (mixture) comprising at least one monomer selected from among monomers represented by the general formula (3) given above and water-soluble nonionic monomers in the presence of said polyalkylenimine and/or modified polyalkylenimine in the sulfate salt form, if

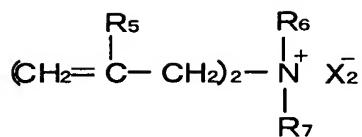
5 necessary further in the presence of a necessary amount of a water-soluble inorganic salt.

9. (Amended) A method of producing water-soluble polymer dispersions, wherein a dispersion of fine particles of a polymer having at least one type of ionicity selected from among cationicity and amphotericity is produced by subjecting a monomer (or 10 monomer mixture) comprising 5 to 100 mole percent of a monomer represented by the general formula (1) and/or (2) given below, 0 to 50 mole percent of a monomer represented by the general formula (3) given below and 0 to 95 mole percent of a water-soluble nonionic monomer to dispersion polymerization with stirring in the presence of a polyalkylenimine and/or a modified polyalkylenimine in the sulfate salt 15 form, if necessary further in the presence of a necessary amount of a water-soluble inorganic salt.



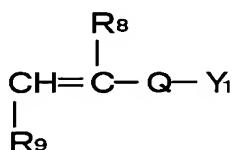
General formula (1)

(In the general formula (1), R_1 is a hydrogen atom or a methyl group, R_2 and R_3 may 20 be the same or different and each is an alkyl or alkoxy group containing 1 to 3 carbon atoms or a benzyl group, R_4 is a hydrogen atom, an alkyl or alkoxy group containing 1 to 3 carbon atoms or a benzyl group. A represents an oxygen atom or NH, B represents an alkylene or alkoxylen group containing 2 to 4 carbon atoms, and X_1 represents an anion.)



General formula (2)

(In the general formula (2), R_5 represents a hydrogen atom or a methyl group, R_6 and R_7 each represents an alkyl or alkoxy group containing 1 to 3 carbon atoms or a benzyl group, and X_2 represents an anion.)

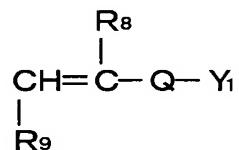


General formula (3)

(In the general formula (3), R_8 represents a hydrogen atom, a methyl group or a carboxymethyl group, Q represents SO_3 , $\text{C}_6\text{H}_4\text{SO}_3$, $\text{CONHC(CH}_3)_2\text{CH}_2\text{SO}_3$, $\text{C}_6\text{H}_4\text{COO}$ or COO , R_9 represents a hydrogen atom or COOY_2 , and Y_1 or Y_2 represents a hydrogen atom or a cation.)

10. (Amended) A method of producing water-soluble polymer dispersions, wherein a dispersion of fine particles of a polymer having at least one type of ionicity selected from among anionicity and nonionicity is produced by subjecting a monomer composition (mixture) comprising at least one monomer selected from among monomers represented by the general formula (3) given below and water-soluble

nonionic monomers to dispersion polymerization with stirring in the presence of a polyalkylenimine and/or a modified polyalkylenimine in the sulfate salt form, if necessary further in the presence of a necessary amount of a water-soluble inorganic salt.



5

General formula (3)